REMARKS

By the present amendment, Claims 1 and 8-10 have been amended, and Claim 5 has been canceled. Claims 1-12 remain pending in the application, with Claims 1 and 8 being independent claims. Claim 1 is again rejected under 35 U.S.C. § 112, second paragraph, for antecedent basis reasons. Claims 8-14 are again rejected under the judicially created doctrine of obviousness-type double patenting (ODP) as allegedly being unpatentable over claims 1-14 of #493 (copending Application No. 10/695,493). Claims 8-14 are again rejected under ODP as allegedly being unpatentable over Claims 1-18 of #197 (copending Application No. 10/694,197) in view of Walton (U.S. Patent Application Publication No. 2004/0156328 A1). Claims 1-5 and 8-11 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shibutani (U.S. Patent Application Publication No. 2003/0002518 A1) in view of newly cited Naguib (an article entitled "A Space-Time coding Modm for High-Data-Rate Wireless Communications". Claims 6, 7 and 12 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shibutani in view of Naguib and Walton (U.S. Patent Application Publication No. 2004/0156328 A1).

In item 6 of the Office Action, the Examiner states that he has not considered reference WO 02/45514 (the '514 reference) because we allegedly did not provide a copy of the '514 reference with the Information Disclosure Statement (IDS) Applicants filed on April 4, 2007. It is noted that the '514 reference was not listed on the PTO Form 1449 filed with the IDS on April 4, 2007. However, the above-described PTO Form 1449 did list WO 02/43314 (the '314 reference) that the Examiner crossed-out and did not consider. Applicants have provided a copy of the '314 reference with another copy of the PTO Form 1449 and respectfully request that the Examiner initial and return a copy of the PTO Form 1449 to ensure full consideration of the '314 reference by the Examiner.

Applicants have submitted terminal disclaimers with the present response to overcome the rejection of Claims 1-12 under ODP over Claims 1-14 of #493, and the rejection of Claims 1-12 under ODP over Claims 1-14 of #197.

Claims 1-3 and 8 have been amended to overcome the rejection of Claim 1 under 35 U.S.C. § 112, second paragraph.

Independent Claim 1 has been amended to recite, in part, an apparatus for transmitting a sequence for channel estimation through M transmission antennas in a mobile communication system, the apparatus comprising: a sequence generator for generating the sequence for the channel estimation; M modulators for modulating information bit streams encoded as a punctured code into modulation symbol streams respectively; M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams output from the M modulators; and M multiplexers individually connected to the M transmission antennas, for multiplexing the punctured signals output from the M puncturers and the sequence to be inserted in the predetermined position, wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period. Claim 8 has also been amended in a similar manner.

With respect to Claims 1 and 8, the Examiner concedes that Shibutani does not teach inserting the sequence in at least one punctured modulation symbol. The Examiner states that Naguib suggests these recitations on page 1460, col. 1, paragraph 1, and asserts that it would have been obvious to modify Shibutani with the alleged suggestions of Naguib.

Shibutani describes a slot assignment algorithm. Naguib describes a space-time coding modem for high-data-rate wireless communications. Walton describes random access for wireless multiple-access communication systems.

With respect to Claims 1 and 8, as previously discussed in the Amendment filed on July 2, 2007, Shibutani describes a slot assignment algorithm for wireless communication systems that support adaptive modulation and coding schemes. Shibutani shows an Access Point (AP) 140 and an Access Terminal (AT) 150 in FIG. 3 that can use the Shibutani slot assignment algorithm. The AP 140 includes a data buffer 141, an encoder 142, an AP controller 143, a modulator 144, an interleaver 145, a puncturer 146, a multiplexer 147, a transmitter 148 and a receiver. In paragraph 40, Shibutani explains that the encoder 142 executes error coding on the data supplied from the error buffer 141 using Turbo coding.

Shibutani expressly states in paragraph 43 that the interleaver 145, the puncturer 146 and the multiplexer 148 are conventional and standard. Shibutani is directed to a scheduling algorithm that guarantees minimum data transport service for ATs with poor channel conditions. Shibutani merely shows the AP 140 and the AT 150 for using the Shibutani scheduling algorithm. Shibutani shows a TDMA frame in FIG. 4 and explains how each frame includes two pilot symbols inserted therein. As shown in FIG. 4 of Shibutani, when a pilot sequence is transmitted, no information data is transmitted, thereby decreasing a data rate.

As conceded by the Examiner, Shibutani nowhere suggests encoding bit streams with an STTC and nowhere suggests transmitting a sequence for channel estimation. Sibutani also nowhere suggests a sequence generator for generating a sequence for channel estimation, nowhere suggests M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams output from the M modulators, and nowhere suggests M multiplexers individually connected to the M transmission antennas, for multiplexing the punctured signals output from the M puncturers and the sequence to be inserted in the predetermined position, as recited in Claim 1. Shibutani also nowhere suggests that at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period, as recited in Claim 8.

The Examiner relies page 1459, col. 1, paragraph 1, of Naguib for satisfying these deficiencies of Shibutani. In this paragraph, Naguib merely describes modem technology suitable for high-data-rate wireless communications based on space-time coded modulation (SCTM) with multiple transmit antennas and orthogonal pilot sequences insertion. In Naguib, a transmitter inserts periodic orthogonal pilot sequences in each one of the simultaneously transmitted bursts. The receiver uses these pilot sequences to estimate the fading channel. In other words, Naruib discloses periodically inserting the orthogonal pilot sequence into data bursts,

This disclosure of Naruib merely means that an interval in which a pilot sequence for channel estimated is transmitted (inserted) into a frame is allocated in a predetermined period, as shown in FIG. 3 regarding prior art of the present application. No information data is transmitted for the time period in which the sequence is transmitted, and as discussed on page 11 of the present application, such a conventional transmission method is referred to in other IEEE papers issued in 1998 by Vahid Tarokh, Nambirajan Seshadri and A. Robert Calderbank, who are authors of Naruib. In Naruib, in the period where the training sequence and the pilot sequence are transmitted, it is impossible to transmit information data. Therefore, Naruib fails to supplement the deficiencies of Shibutani. Walton also fails to supplement the deficiencies of Shibutani.

In contrast, referring to page 19, lines 5-10 of the present application, the present invention does not use the period in which the pilot sequence is transmitted as in a conventional manner, but punctures a period in which information data is transmitted in a predetermined position and transmits a pilot sequence in a portion where the information data is punctured, as shown in FIG. 7 of the present application. As a result, in a mobile communication system using STTC according to the present invention, information is transmitted even during transmission of the pilot sequence, thereby increasing a data rate and improving system performance.

Furthermore, in the present invention at least one of the positions where the information data is punctured for modulation symbol streams is different from the other positions where the information data is punctured for each antenna in a same transmission period.

As a result, the information data together with the pilot sequence can be transmitted without reducing the diversity gain in a communication system in which the punctured code, such as STTC encoding, is used. Accordingly, the present invention provides an advantage of improving the data rate as compared with the conventional method.

In addition, the Examiner states that FIG. 3 of Shibutani illustrates a puncturer 146 for puncturing information data, and a configuration of multiplexing the punctured information data and a pilot symbol in the MUX 147. However, the puncturer 146 of Shibutani is used to adjust the code rate according to the determined MCS level in a transmitter of a general communication system.

On the contrary, in the present invention, the puncturer performs puncturing without reducing diversity gain in a communication system in which multiple antennas and a punctured antenna are used.

Accordingly, the puncturing operation of the present invention is clearly different from the puncturing operation in Shibutani.

More particularly, Shibutani, Walton, or any combination thereof, fails to teach or reasonably suggest an apparatus for transmitting a sequence for channel estimation through M transmission antennas in a mobile communication system, the apparatus comprising: a sequence generator for generating the sequence for the channel estimation; M modulators for modulating information bit streams encoded as a punctured code into modulation symbol streams respectively; M puncturers for puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams

output from the M modulators; and M multiplexers individually connected to the M transmission antennas, for multiplexing the punctured signals output from the M puncturers and the sequence to be inserted in the predetermined position, wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each antenna in a same transmission period, as recited in Claim 1. Shibutani, Walton, or any combination thereof, also fails to teach or reasonably suggest a method for transmitting a sequence for channel estimation in a mobile communication system, the method comprising the steps of: modulating information bit streams encoded as a punctured code into modulation symbol streams respectively; puncturing at least one modulation symbol in a predetermined position at each transmission antenna for each of the modulation symbol streams; generating the sequence for the channel estimation; multiplexing the punctured modulation symbol streams at each transmission antenna and the sequence to be inserted in the predetermined position; and transmitting the multiplexed signals through M transmission antennas, wherein at least one of puncturing positions for the modulation symbol streams is different from other puncturing positions at each transmission antenna in a same transmission period, as recited in Claim 8.

Accordingly, amended Claims 1 and 8 are allowable over Shibutani, Naguib, Walton, or any combination thereof.

While not conceding the patentability of the dependent claims, *per se*, Claims 2-4, 6, 7 and 9-12 are also allowable for at least the above reasons.

Accordingly, all of the claims pending in the Application, namely, Claims 1-4 and 6-12, are in condition for allowance. Should the Examiner believe that a telephone conference or personal interview would facilitate resolution of any remaining matters, the Examiner may contact Applicants' attorney at the number given below.

Respectfully submitted,

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